

## CLAIMS

What is claimed is:

1. A paper feeding apparatus of an image forming device, comprising:  
a main body; and  
a paper cassette, rotatably connected to the main body, automatically moved between a storage position and a paper feeding position, and storing paper in both the storage and paper feeding positions.
2. The paper feeding apparatus according to claim 1, further comprising:  
a feeder opening and closing unit automatically moving the paper cassette between the storage position and the paper feeding position by selectively employing a driving source that drives a pickup roller and a feed roller.
3. The paper feeding apparatus according to claim 2, wherein the feeder opening and closing unit comprises:  
at least one hinge bracket rotatably connecting the paper cassette to a pickup roller shaft, on which the pickup roller is installed.
4. The paper feeding apparatus according to claim 3, wherein the feeder opening and closing unit comprises:  
an actuator to selectively employ the driving source.
5. The paper feeding apparatus according to claim 4, wherein the feeder opening and closing unit further comprises:  
a pickup roller driving gear disposed on the pickup roller shaft and having  
a backlash groove, and  
an inner gear installed to rotate within the backlash groove, allowing the pickup roller shaft to rotate within a first predetermined range without transferring power to the pickup roller;  
a stop gear positioned at the hinge bracket;

a rotating gear member disposed on the pickup roller shaft, selectively engaging the stop gear to move the paper cassette between the storage and paper feeding positions; and

a first restoring member to bias the rotating gear member to be disengaged from the stop gear.

6. The paper feeding apparatus according to claim 5, wherein:  
the first restoring member is a spring.

7. The paper feeding apparatus according to claim 5, wherein:  
only a portion of the stop gear has teeth.

8. The paper feeding apparatus according to claim 5, wherein the rotating gear member comprises:

a pin positioned on the pickup roller shaft; and

a rotating gear disposed on the pickup roller shaft, movable between being engaged with the stop gear and being disengaged with the stop gear, and having a hole positioned axially, enabling the rotating gear to rotate with and move along the pickup roller shaft, when the pin is engaged with the hole.

9. The paper feeding apparatus according to claim 5, wherein the actuator comprises:

an actuating lever, disposed on the pickup roller shaft between the pickup roller driving gear and the rotating gear member, and movable along the pickup roller shaft, and movable between a position in a path of a carrier, and a position beyond the path of the carrier,

a second restoring member, biasing the actuating lever to an original position when the carrier is not exerting a force on the actuating lever; and

a rubber ring enabling the actuating lever to idle without rotating once the actuating lever is rotated beyond a second predetermined range.

10. The paper feeding apparatus according to claim 9, wherein:  
the second restoring member is a spring.

11. The paper feeding apparatus according to claim 9, wherein:

the second predetermined range is 15°.

12. The paper feeding apparatus according to claim 4, wherein the feeder opening and closing unit further comprises:

- a knockup plate disposed in the paper cassette to move the paper stored in the paper cassette toward the pickup roller;

- a rotating movement-transforming member disposed on the main body, transforming a linear movement of the actuating lever when moved by the carrier into a rotating movement; and

- a linear movement-transforming member transforming the rotating movement into a linear movement perpendicular to a moving direction of the carrier, and transmitting the transformed linear movement to the knockup plate.

13. The paper feeding apparatus according to claim 12, wherein the rotating movement-transforming member comprises:

- a slider having an engaging projection at a first end to restrict a moving path of the actuating lever, and at least one sliding bracket supported movably on the main body;

- a crank having

  - a first end rotatable by a second end of the slider when the actuating lever is restored into the original position by the second restoring member, and

  - a second end rotating between first and second positions when the first end thereof is rotated;

- a crank extension member to rotate the first end of the crank in a first rotational direction when the slider is moved in a first direction by the actuating lever; and

- a slider restoring member to bias the slider toward an original position to rotate the first end of the crank in a second rotational direction when the actuating lever is moved to the original position.

14. The paper feeding apparatus according to claim 13, wherein:

the slider restoring member is a spring.

15. The paper feeding apparatus according to claim 13, wherein the linear movement-transforming member comprises:

- a knockup plate driver having

a first end supported pivotally on the main body, and  
a second end with

a first end surface contacting the second end of the crank and moving between first and second knockup plate driver positions when the second end of the crank respectively rotates between first and second positions, and

a second end surface positioned opposite to the knockup plate at an opposite side of the first end surface to move the knockup plate toward the pickup roller when the first end surface moves to the first knockup plate driver position; and

a driver restoring member to move the knockup plate driver to the second knockup plate driver position when the second end of the crank is rotated into the second position.

16. The paper feeding apparatus according to claim 15, wherein:  
the driver restoring member is a spring.

17. The paper feeding apparatus according to claim 15, wherein the feeder opening and closing unit further comprises:

a paper separating roller rotatably supported on the main body; and

a paper separating member contacting the paper separating roller when the first end surface of the second end of the knockup plate driver moves to the first knockup plate driver position.

18. The paper feeding apparatus according to claim 17, wherein the paper separating member comprises:

a friction pad member rotatably disposed on the main body and having a friction pad positioned to contact the paper separating roller; and

a friction pad extension member to bias the friction pad member toward the paper separating roller when the knockup plate is moved toward the pickup roller.

19. The paper feeding apparatus according to claim 4, wherein the feeder opening and closing unit further comprises:

a first photo sensor having a light emitting part and a light receiving part disposed on the main body; and

a sensor actuator elastically and rotatably disposed on the main body, actuated by one of the paper cassette and the at least one hinge bracket, when the paper cassette is moved into one of the storage position and the paper feeding position.

20. The paper feeding apparatus according to claim 19, wherein the sensor actuator comprises,

a first lever, actuated to interfere between the light emitting part and the light receiving part of the first photo sensor and turn off the first photo sensor when the paper cassette is moved into the storage position;

a rotating axis rotatably disposing the first lever on the main body; and

a lever restoring member biasing the first lever to not interfere between the light emitting part and the light receiving part of the first photo sensor, to turn on the first photo sensor when the paper cassette is moved into the paper feeding position.

21. The paper feeding apparatus according to claim 20, wherein:  
the lever restoring member is a spring.

22. The paper feeding apparatus according to claim 20, wherein:  
the feeder opening and closing unit further comprises a second photo sensor having a light emitting part and a light receiving part, actuated by the first lever; and  
the sensor actuator further comprises a second lever, projecting from the rotating axis into a paper feeding path, and actuated by a leading end of the paper passing through the paper feeding path to actuate the first lever,  
wherein the second photo sensor is one of disposed adjacent to the first photo sensor and spaced-apart from the first photo sensor.

23. The paper feeding apparatus according to claim 20, wherein the feeder opening and closing unit further comprises:  
an alarm portion to sense abnormal operation of the paper feeding apparatus and at least one of display an error message and sound an alarm.

24. The paper feeding apparatus according to claim 23, wherein the alarm portion comprises:

an encoder disposed at the driving source, to detect an amount of rotation of the driving source;

a controller to compare an amount of rotation of the driving source required to open and close the paper feeder with an operating time of the first photo sensor to determine whether there is an abnormal condition; and

at least one of a speaker to sound the alarm, and a display to display the alarm message if the abnormal condition exists.

25. A paper feeding apparatus of an image forming device, comprising:
- a main body;
  - a paper cassette having a knockup plate, rotatably connected to the main body, and storing paper in a storage position and a paper feeding position;
  - an actuator; and
  - a carrier, engaging the actuator to selectively
    - employ a driving source that drives a pickup roller and a feed roller to automatically move the paper cassette between the storage position and the paper feeding position, and
    - engage a movement-transforming member transforming linear motion in a first direction to linear motion in a second direction perpendicular to the first direction to move the knockup plate to move the paper toward the feed roller.